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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ANDREW JEREMIAH BURNS and RAMESH SUBRAMANIAN

Appeal 2009-002765
Application 10/649,536
Technology Center 3700

Decided: August 18, 2009

Before WILLIAM F. PATE, III, MICHAEL W. O'NEILL, and
STEFAN STAICOVICI, *Administrative Patent Judges*.

STAICOVICI, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Andrew Jeremiah Burns et al. (Appellants) appeal under 35 U.S.C. § 134 from the Examiner's decision rejecting claims 1-6, 8-11, 13-17, 36, and 37. Claims 7, 12, 18-35, 38, and 39 have been canceled. We have jurisdiction over this appeal under 35 U.S.C. § 6 (2002).

THE INVENTION

The Appellants' invention is drawn toward a method of making a ceramic thermal barrier coating 18 for a gas turbine component by forming a plurality of gaps 28 using multiple passes of a laser beam such that the laser energy applied to form each gap 28 is different between successive passes. Specification 1, ll. 9-10; Specification 6, ll. 29-32; Specification 9, ll. 23-26; and fig. 1.

Claim 1 is representative of the claimed invention and reads as follows:

1. A method of manufacturing an insulated component, the method comprising:

providing a substrate having a surface;

depositing a layer of ceramic insulating material on the substrate surface; and

forming a continuous gap in a top surface of the layer of ceramic insulating material to define segments therein, the continuous gap having a width at the top surface of less than 100 microns;

further comprising forming the continuous gap by:

exposing the top surface to a first pass of laser energy having a first parameter to form the continuous gap; and

exposing the continuous gap to a second pass of laser energy having a second parameter different than the first parameter to change a geometry of the continuous gap.

THE REJECTIONS

The Examiner relies upon the following as evidence of unpatentability:

Wolfa ¹	US 5,951,892	Sep. 14, 1999
Strom	US 6,443,813 B1	Sep. 3, 2002
Rigney	US 2003/0101587 A1	Jun. 5, 2003
Young	US 2003/0209859 A1	Nov. 13, 2003
O'Brien	US 6,676,878 B2	Jan. 13, 2004
Watson	US 2004/0266615 A1	Dec. 30, 2004

The following rejections are before us for review:

The Examiner rejected claims 1-6, 8-11, 13-17, 36, and 37 under 35 U.S.C. § 103(a) as unpatentable over Wolfa, Young, Strom, and O'Brien.²

The Examiner rejected 16, 17, and 36 under 35 U.S.C. § 103(a) as unpatentable over Wolfa, Young, Strom, O'Brien, Rigney, and Watson.³

¹ The first inventor of US Patent No. 5,951,892, issued Sep. 14, 1999, is "Wolfa." Inasmuch as both the Examiner and the Appellants have referred to this reference as "Wolfa," we do likewise in this opinion for consistency.

² The Examiner appears to employ the disclosures of Young, Strom, and O'Brien in the alternative.

³ The Examiner appears to employ the disclosures of Rigney and Watson in the alternative.

THE ISSUES

1. Have the Appellants shown that the Examiner erred in determining that each of Young, Strom, and O'Brien discloses forming a gap using multiple passes of a laser beam and changing a laser parameter between subsequent passes?
2. Have the Appellants shown that the Examiner erred in determining that each of Rigney and Watson discloses using laser energy to form a second grooved layer overlying a first grooved layer?

SUMMARY OF DECISION

We AFFIRM.

FINDINGS OF FACT

The following enumerated findings of facts (FF) are supported by at least a preponderance of the evidence. *Ethicon, Inc. v. Quigg*, 849 F.2d 1422, 1427 (Fed. Cir. 1988) (explaining the general evidentiary standard for proceedings before the Office).

1. Young discloses a process for making a seal ring 10 using a laser unit 14 to form micro-topography depth features in the seal face 15. Young, ¶ [0037] and fig. 1. Such micro-topography features include waves 22 and valleys 23, spiral grooves, and T-shaped grooves. Young, ¶¶ [0040] and [0044].
2. Young further discloses forming the valley 23 by moving the laser beam 101 through a first plurality of passes along a first cutting radius CR1 to cut a first ablation cut 103 extending between ends 104 and 105. An additional cutting pass is

provided between ends 106 and 107. Young, ¶ [0074] and fig. 7.

3. Strom discloses a process for making sliders 70 by laser cutting along a dice lane 68 in overlapping passes 76. Strom, col. 5, ll. 1-21 and figs. 6 and 8.
4. Strom further discloses that during subsequent passes, because laser energy is more concentrated due to less material to cut, burrs 78 form on the forward side of the cut path. The burrs 78 are minimized by reduction of the laser cutting power during the second and subsequent passes. Strom, col. 5, ll. 46-61 and figs. 7 and 8.
5. O'Brien discloses a process for cutting a silicon wafer along a cutting path 112. The process includes making segmented laser cuts 122a, 122b, and 122c by making a plurality of passes 132a, 132b, and 132c. O'Brien, col. 11, ll. 8-20 and fig. 10.
6. Each segment 122 is completely cut using multiple passes 132 before a subsequent segment 122 is processed. O'Brien, col. 11, l. 66 through col. 12, l. 5.
7. O'Brien further discloses that it is possible to change laser parameters during any given pass 132. O'Brien, col. 12, ll. 37-41.
8. Wolfa discloses forming a textured abradable seal including providing a substrate, depositing a bond coat, depositing a ceramic layer over the bond coat, machining the surface of the ceramic layer, and laser texturing the ceramic layer. Wolfa, col. 3, ll. 39-56.

9. Rigney discloses a process for repairing a thermal barrier coating including removing the damaged coating to expose the bond coat, laser grooving the bond coat, depositing a ceramic layer over the textured bond coat, and polishing the ceramic layer. Rigney, ¶¶ [0028] and [0032].
10. Watson discloses a reactor for a steam reforming process including at least 10 microchannel reaction channels holding steam reforming catalyst 6 (non-grooved layer) *interleaved*⁴ with at least 10 adjacent multiple heat exchange layers 12 having channels 14 (grooved layer). Watson, ¶¶ [0061], [0063], and [0068] and fig. 1.

PRINCIPLES OF LAW

Obviousness

It is elementary that to support an obviousness rejection all words in a claim must be considered in judging the patentability of that claim against the prior art. *In re Wilson*, 424 F.2d 1382, 1385 (CCPA 1970).

"Section 103 forbids issuance of a patent when 'the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.'" *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying

⁴ A dictionary definition of the term "interleave" is to arrange in "alternating layers." MERRIAM WEBSTER'S COLLEGIATE DICTIONARY 610 (Tenth Ed. 1997).

factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). *See also KSR*, 550 U.S. at 407 ("While the sequence of these questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls.")

OPINION

Issue (1)

The Appellants argue the rejection under 35 U.S.C. § 103(a) of claims 1-6, 8-11, 13-17, 36, and 37 together as a group. Br. 4. Accordingly, we have selected claim 1 as the representative claim to decide the appeal, with claims 2-6, 8-11, 13-17, 36, and 37, standing or falling with claim 1. *See* 37 C.F.R. § 41.37(c)(1)(vii)(2008).

The Appellants argue that neither Young, Strom, nor O'Brien discloses "multiple passes of laser energy and multiple laser energy parameters." Br. 4. According to the Appellants, each of Young, Strom, and O'Brien discloses:

...multiple passes of the same laser energy beam, or
beams with different parameters being used in different
gaps.

Br. 4.

Specifically, with respect to the disclosure of Young, the Appellants argue that the change in laser beam parameters is "from one gap to another gap" and that Young does not teach or suggest making multiple passes in a single groove while modifying a laser parameter. *Id.* Similarly, with respect to Strom, the Appellants argue that "[n]owhere does Strom discuss changing

the laser parameters from pass to pass.” Br. 5. Lastly, regarding the disclosure of O’Brien, the Appellants argue that O’Brien does not disclose or suggest changing the laser parameters between passes. *Id.*

In response, the Examiner takes the position that:

[T]he secondary references to Young et al, Strom et al, and O’Brien et al respectively describe changing groove shapes, reducing or changing laser power, and changing laser parameters during any pass.

Ans. 5.

The obviousness rejection based on Wolf and Young

As noted above, Young discloses a process for making a seal ring 10 using a laser unit 14 to form micro-topography depth features in the seal face 15. FF 1. Young further discloses forming a valley 23 by moving the laser beam 101 through a first plurality of passes along a first cutting radius CR1 to cut a first ablation cut 103 extending between ends 104 and 105 followed by an additional cutting pass between ends 106 and 107. FF 2. A person of ordinary skill in the art would have readily appreciated that the second cutting pass between ends 106 and 107 is shorter than the first cutting pass between ends 104 and 105 and as such, the (laser) cutting time is shorter. Hence, we find that the amount of laser energy provided for ablating (cutting) along the first cutting radius CR1 of the seal 10 of Young decreases between the first and second pass.

In conclusion, in contrast to the Appellants’ position, we find that Young discloses making multiple passes in a single groove while modifying a laser parameter (laser cutting time). Accordingly, the rejection of claim 1,

and claims 2-6, 8-11, 13-17, 36, and 37, standing or falling with claim 1, as unpatentable over Wolfa and Young is sustained.

The obviousness rejection based on Wolfa and Strom

Strom discloses a process for cutting sliders 70 along a dice lane 68 by laser cutting along overlapping passes 76. FF 3. Strom further discloses that during subsequent passes, because laser energy is more concentrated due to less material to cut, burrs 78 form on the forward side of the cut path. The burrs 78 may be minimized by reduction of the laser cutting power during the second and subsequent passes. FF 4. Hence, Strom specifically discloses modifying the laser power (energy) during the second and subsequent passes.

As such, we find that Strom specifically discloses making multiple passes in a single groove while modifying a laser parameter (laser power). Accordingly, the rejection of claim 1, and claims 2-6, 8-11, 13-17, 36, and 37, standing or falling with claim 1, as unpatentable over Wolfa and Strom is sustained.

The obviousness rejection based on Wolfa and O'Brien

O'Brien discloses a process for cutting a silicon wafer along a cutting path 112. The process includes making segmented laser cuts 122a, 122b, and 122c using a plurality of passes 132a, 132b, and 132c. FF 4. Each segment 122 is completely cut using multiple passes 132 before a subsequent segment 122 is processed. FF 5. Lastly, O'Brien discloses that it is possible to change laser parameters during any given pass 132. FF 6. Hence, O'Brien specifically discloses modifying the laser parameters between subsequent passes.

As such, we find that O'Brien discloses making multiple passes in a single groove while modifying the laser parameters. Accordingly, the rejection of claim 1, and claims 2-6, 8-11, 13-17, 36, and 37, standing or falling with claim 1, as unpatentable over Wolfa and O'Brien is sustained.

Issue (2)

The obviousness rejection based on Wolfa and Young, Strom, and O'Brien, in the alternative, and Rigney

The Appellants argue the rejection under 35 U.S.C. § 103(a) of claims 16, 17, and 36 together as a group. Br. 6. We have selected claim 16 as the representative claim to decide the appeal, with claims 17 and 36 standing or falling with claim 16.

The Appellants argue that "Rigney specifically teaches away from forming any groove in the top surface layer." Br. 6. According to the Appellants, Rigney does not disclose "overlying double grooved layers." *Id.* In contrast, the Examiner takes the position that Rigney discloses "repairing a damaged engraved layer by cleaning, grooving, and depositing" and that it would have been obvious to a person of ordinary skill in the art to overlies a first grooved coating with a second grooved coating "depending on intended use such as for *repair* or for forming a known structure." Ans. 6. Emphasis added.

However, simply that there are differences between two references is insufficient to establish that such references "teach away" from any combination thereof. *See In re Beattie*, 974 F.2d 1309, 1312-13 (Fed. Cir. 1992). One cannot establish nonobviousness by attacking the references individually when the rejection is predicated upon a combination of prior art

disclosures. *See In re Merck & Co. Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). In this case, Wolfa discloses forming a textured abradable seal including providing a substrate, depositing a bond coat over the substrate, depositing a ceramic layer over the bond coat, machining the surface of the ceramic layer, and laser texturing the ceramic layer. FF 8. Rigney discloses a process for repairing a thermal barrier coating including removing the damaged coating to expose the bond coat, laser grooving the bond coat, depositing a ceramic layer over the textured bond coat, and polishing the ceramic layer. FF 9. According to the combined teachings of Wolfa and Rigney, we find that a person of ordinary skill in the art would have readily recognized that repairing the abradable seal of Wolfa and Rigney includes removing the damaged ceramic material to expose the bond coat (first layer), laser texturing the bond coat (to form a first grooved layer), depositing a new ceramic layer (second layer), polishing the new ceramic layer, and finally, laser texturing the new ceramic layer (second grooved layer).

As such, we agree with the Examiner that the combined teachings of Wolfa and Rigney would have readily suggested to a person of ordinary skill in the art overlying double grooved layers. Accordingly, the rejection of claim 16, and claims 17 and 36 standing or falling with claim 16, as unpatentable over Wolfa and Young, Strom, and O'Brien, in the alternative, and Rigney is sustained.

*The obviousness rejection based on Wolfa and Young, Strom, and O'Brien,
in the alternative, and Watson*

With respect to the disclosure of Watson, the Appellants argue that Watson does not disclose “any multiple layers of grooved material” but only

“multiple grooves in a single top layer.” Pointing to paragraph [0063] of Watson the Examiner responds that:

Watson et al describe [0063] forming multiple layers for multiple channels and describe surface deposit of ceramic material, etching the surface, and again depositing and laser grooving the surface in repair of buildup manufacture.

Ans. 6.

As noted above, Watson discloses a reactor for a steam reforming process including at least 10 microchannel reaction channels holding steam reforming catalyst 6 (non-grooved layer) *interleaved* with at least 10 adjacent multiple heat exchange layers 12 having channels 14 (grooved layer). FF 10. We could not find and the Examiner has not pointed to any portion of Watson that discloses depositing a ceramic material, etching the surface, depositing a second layer, and laser grooving the second layer. At most, we find that Watson discloses at least 10 non-grooved layers (microchannel reaction channels) alternating (interleaved) with 10 adjacent grooved layers (multiple heat exchange layers). Hence, in contrast to the Examiner’s position, we find that Watson does not disclose *overlying* double grooved layers. In other words, Watson does not disclose a second grooved layer over a first grooved layer. Therefore, the rejection of claim 16, and dependent claims 17 and 36, as unpatentable over Wolfa and Young, Strom, and O’Brien, in the alternative, and Watson cannot be sustained.

CONCLUSIONS

1. The Appellants have failed to show that the Examiner erred in determining that each of Young, Strom, and O’Brien discloses

- forming a gap using multiple passes of a laser beam and changing a laser parameter between subsequent passes.
2. The Appellants have failed to show that the Examiner erred in determining that Rigney discloses using laser energy to form a second grooved layer overlying a first grooved layer.
 3. The Appellants have shown that the Examiner erred in determining that Watson discloses using laser energy to form a grooved ceramic layer overlying a first grooved layer.

DECISION

The Examiner's rejection of claims 1-6, 8-11, 13-17, 36, and 37 under 35 U.S.C. § 103(a) as unpatentable over Wolfa in view of Young, Strom, and O'Brien, in the alternative, is affirmed.

The Examiner's rejection of claims 16, 17, and 36 under 35 U.S.C. § 103(a) as unpatentable over Wolfa in view of Young, Strom, and O'Brien, in the alternative, and Rigney is affirmed.

The Examiner's rejection of claims 16, 17, and 36 under 35 U.S.C. § 103(a) as unpatentable over Wolfa in view of Young, Strom, and O'Brien, in the alternative, and Watson is reversed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv) (2007).

AFFIRMED

LV

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